High Temperature InGaN-based Solar Cells

Completed Technology Project (2015 - 2018)

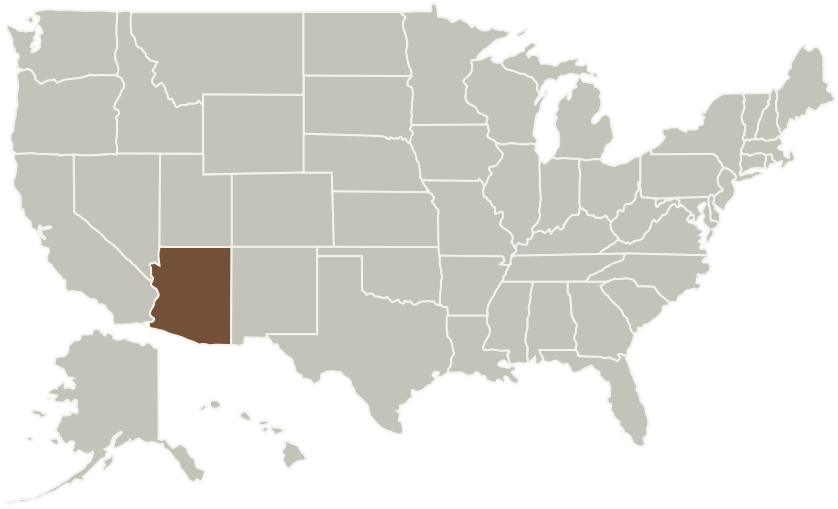
Project Introduction

An efficient generation of solar power in a space environment is an enduring challenging for all NASA missions. The current available solar cells, however, suffer from a large efficiency drop under high temperature environments, which put significant constrains in inner planet missions. The goal of this research is to develop a highly efficient InGaN-based solar cell that enables a transformational change in the ability to efficiently generate power without concerns of operational temperatures. The key aspects of the approach are to capitalize on the unique properties of the III-nitride material systems, which exclusively among commercial semiconductors allow high temperature operation. By combining advanced MOCVD growth technique and novel device design, a tandem solar cell device based on InGaN materials will be developed for efficient operation with over 25% efficiency at temperatures above 400 °C. A successful outcome of the research will be very beneficial to various NASA missions as power generation is critical to space technology, especially for Science Mission Directorate (SMD) missions focused on destinations closer to the Sun.

Anticipated Benefits

A successful outcome of the research will be very beneficial to various NASA missions as power generation is critical to space technology, especially for Science Mission Directorate (SMD) missions focused on destinations closer to the Sun.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Arizona State University-Tempe(ASU)	Lead Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH)	Tempe, Arizona

Primary U.S. Work Locations
Arizona

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Arizona State University-Tempe (ASU)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

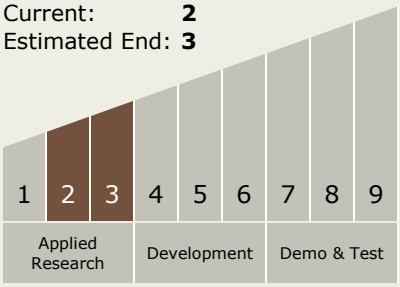
Hung D Nguyen

Principal Investigator:

Yuji Zhao

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

Target Destinations

Mars, Earth, Others Inside the Solar System